WHAT IS CLAIMED IS:

1. A turning tool for cutting circumferential grooves into a surface of a polishing pad formed of a resin material and utilized for polishing semiconductor devices, said turning tool comprising:

a cutting part arranged to have a tooth width within a range of 0.005-1.0mm, a wedge angle within a range of 15-35 degrees, and a front clearance angle within a range of 65-45 degrees.

2. A turning tool according to claim 1, wherein said cutting part has a rake angle within a range of 20-10 degrees.

3. A turning tool according to claim 1, wherein said cutting part has a side clearance angle with respect to a radially outer wall of each of said grooves, which is held within a range of 0-3 degree.

4. A turning tool according to claim 1, wherein said turning tool includes a plurality of cutting parts which are arranged in a predetermined direction with a pitch within a range of 0.2-2.0mm.

5. A turning tool according to claim 4, wherein said plurality of cutting parts are arranged in a predetermined direction with regular pitches.

6. A turning tool according to claim 4, further comprising a plate-like shaped tool tip having a plurality of cutting parts integrally formed at one of edge portions thereof so as to protrude outwardly from said one of said edge portions.

7. A turning tool according to claim 6, wherein said turning

tool comprising a plurality of said tool tips, said tool tips being fixedly arranged with each other so as to be aligned in a width direction thereof, said cutting parts of said plurality of tool tips cooperate to form a multiplicity of cutting parts.

8. A turning tool according to claim 7, further comprising a predetermined tool-tip holder to which said plurality of said plate-like shaped tool tips are detachably fixed, said tool tip holder and said plurality of tool tips cooperate to constitute a tool unit.

9. A turning tool according to claim 4, further comprising a plurality of cutting tips each having one of said cutting parts, said plurality of cutting tips are detachably fixed to each other so that cutting parts of said plurality of cutting tips cooperate to form a plurality of cutting parts.

10. A turning tool according to claim 9, wherein said plurality of cutting tips are superposed on and integrally fixed to one another with spacers interposed adjacent ones of the cutting tips so that the spacers function to keep a pitch of said plurality of cutting tips.

11. A turning tool according to claim 9, further comprising a cutting-tip holder to which the plurality of cutting tips are detachably fixed, said cutting tip holder and said cutting tips cooperate to constitute a unit tool.

12. A turning tool according to claim 10, further comprising a cutting-tip holder to which the plurality of cutting tips are detachably fixed, said cutting tip holder and said cutting tips cooperate to constitute a unit tool.

13. A turning tool according to claim 1, wherein said cutting part has a tip portion arcuately curved in a width direction thereof so that

said tip portion has two end parts opposed in said width direction, said two end parts of said tip portion protruding outwardly from an intermediate part of said tip portion in a direction perpendicular to said width direction.

14. A turning tool according to claim 1, wherein said cutting part has a tip portion being serrated.

15. A turning tool according to claim 1, wherein said cutting part has at least one side surface being serrated.

16. A method of producing a polishing pad made of a resin material, comprising the steps of:

positioning a turning tool comprising a cutting part arranged to have a tooth width within a range of 0.005-1.0mm, a wedge angle within a range of 15-35 degrees, and a front clearance angle within a range of 65-45 degrees, relative to a base for said polishing pad formed of said resin material;

rotating said cutting part of said turning tool relative to said base for said polishing pad about an axis of said base for said polishing pad, for cutting circumferential grooves into a surface of said base such that radially inner most one of said circumferential grooves has a radius of curvature of 10mm or smaller.

17. A method of producing a polishing pad according to claim 16, wherein said turning tool comprises a plurality of cutting parts which are arranged in a predetermined direction with a pitch within a range of 0.2-2.0mm, and wherein said circumferential grooves comprises a multiplicity of generally concentric annular grooves, said method further comprising the steps of:

simultaneously cutting a plurality of said generally concentric

grooves into said surface of said base for said polishing pad such that radially inner most one of said multiplicity of generally concentric annular grooves has a radius of curvatures of 10mm or smaller.

18. A method of producing a polishing pad according to claim 17, wherein said plurality of cutting parts are arranged in a predetermined direction with regular pitches.

19. A method of producing a polishing pad according to claim 16, wherein said turning tool comprises a plate-like shaped tool tip having a plurality of cutting parts integrally formed at one of edge portions thereof so as to protrude outwardly from said one of said edge portions and arranged in a predetermined direction with a pitch within a range of 0.2-2.0mm, and wherein said circumferential grooves comprises a multiplicity of generally concentric annular grooves, said method further comprising the steps of:

simultaneously cutting a plurality of said generally concentric grooves into said surface of said base for said polishing pad such that radially inner most one of said multiplicity of generally concentric annular grooves has a radius of curvatures of 10mm or smaller.

20. A method of producing a polishing pad according to claim 19, wherein said turning tool comprises a plurality of said plate-like shaped tool tips, said tool tips being fixedly arranged with each other so as to aligned in a width direction thereof such that said cutting parts of said tool tips cooperate to form a multiplicity of cutting parts.

21. A method of producing a polishing pad according to claim 20, wherein said turning tool further comprises a predetermined tool-tip holder to which said plurality of said plate-like shaped tool tips are detachably fixed, said tool tip holder and said plurality of tool tips cooperate

to constitute a tool unit.

22. A method of producing a polishing pad according to claim 16, wherein said turning tool comprises a plurality of cutting tips each having a cutting part and detachably fixed to each other so that cutting parts of said plurality of cutting tips cooperate to form a plurality of cutting parts which are arranged in a predetermined direction with a pitch within a range of 0.2-2.0mm, and wherein said circumferential grooves comprises a multiplicity of generally concentric annular grooves, said method further comprising the steps of:

simultaneously cutting a plurality of said generally concentric grooves into said surface of said base for said polishing pad such that radially inner most one of said multiplicity of generally concentric annular grooves has a radius of curvatures of 10mm or smaller.

23. A method of producing a polishing pad according to claim 16, wherein said turning tool is adapted to cut said circumferential grooves into said surface of said base for said polishing pad at a feed per revolution of 0.005-0.05mm/rev in a depth direction of said base.

24. A method of producing a polishing pad according to claim 16, further comprising the steps of:

blowing ionic fluid toward a vicinity of said cutting parts to neutralize said base of said polishing pad and chips which are electrically charged due to execution of said step of cutting by the turning tool said circumferential grooves into said surface of said base for said polishing pad.

25. A polishing pad comprising:

a base made of a resin material; and

circumferential grooves open in a surface of said base, said

grooves having a width within a range of 0.005-1.0mm, a depth of 0.2-2.0mm, and a pitch of 0.2-2.0mm,

wherein radially inner most one of said circumferential grooves has a radius of curvature of not larger than 10mm.

26. A polishing pad according to claim 25, wherein radially outer most one of said grooves has a radius of curvature of not less than 100mm.

27. A polishing pad according to claim 25, wherein said radially inner most one of said grooves has a radius of curvature of not larger than 10mm, and said polishing pad has a diameter which is made smaller than that of a working piece.

28. A polishing pad according to claim 25, wherein said circumferential grooves are spaced apart from each other at uniform pitch.

29. A polishing pad according to claim 25, wherein said base is a rigid urethane foam member, and said multiplicity of generally concentric grooves are formed with a width of 0.20-0.30mm, a depth of 0.1-1.0mm and a pitch of 1.0-2.0mm.

30. A polishing pad according to claim 25, wherein said polishing pad is usable for polishing a substrate of multilevel interconnection type in which is formed an interconnect line having a width of 0.18μm.

31. A polishing pad according to claim 25, wherein said polishing pad is adapted to be directly placed on a platen of a polishing device for polishing semiconductor devices, without needing an elastic layer interposed therebetween.

32. A machine for grooving a base for a polishing pad made of a resin material, said machine comprising:

a bed;

a platen including a hollow shaft member supported by said bed via bearing so that said hollow shaft member is rotatably about a C-axis which is perpendicular to said bed;

a suction plate fixed to one of opposite axial end portions of said hollow shaft member remote from said bed and formed with a plurality of through holes arranged evenly over an entire area thereof for attracting the base for the polishing pad to be placed on said suction plate;

drive mechanism for rotating said platen about said C-axis and for positioning said platen at a suitable angular position;

a gate-shaped column having two legs which are opposed to each other with a spacing therebetween and a cross rail extending between and being perpendicular to said two legs, said gate-shaped column being movable in a direction of an X-axis with said cross rail extending across said platen;

at least one saddle mounted on said cross rail so as to be movable in a direction of a Y-axis extending along said cross rail;

a tool rest mounted on said saddle so as to be independently reciprocally movable in a direction of a Z-axis, said tool rest adapted to detachably hold a fixed tool comprising a turning tool comprising a cutting part arranged to have a tooth width within a range of 0.005-1.0mm, a wedge angle within a range of 15-35 degrees, and a front clearance angle within a range of 65-45 degrees;

drive motors for moving and positioning said platen, said column and said saddle and said tool rest; and

a numerical control apparatus totally control an operation of said drive motor,

wherein said hollow shaft member of said platen is connectable to an air suction device so as to attract said base for said polishing pad on said suction plate by a suction force applied from said air suction device to said base for said polishing pad, and

wherein said machine being operable to cut by said turning tool a multiplicity of generally concentric annular grooves into a surface of said base for said polishing pad with said base for said polishing pad being attracted on said suction plate.

33. A machine according to claim 32, further comprising:

an ion-blowing device for neutralizing said static electricity charged in said polishing pad and chips, for separating said chips from said fixed tool and said polishing pad,

wherein said ion blowing device includes an ion generating device for generating ion, an ion extruding nozzle for extruding said ion toward said cutting part of said fixed tool, an air blowing device for blowing air together with said ion.

34. A machine according to claim 32, wherein said tool rest detachably supports a rotative tool selected from a group consisting of a milling cutter unit and a drill unit.

35. A machine according to claim 32, wherein said milling cutter unit including at least one milling cutter fixedly supported by a tool shaft extending along a center axis thereof, said at least one cutter including a disk-shaped body member and a plurality of cutting edges disposed at an outer peripheral portion of said body member at regular angular intervals, and each having a wedge angle within a range of 20-40 degrees, and a front clearance within a range of 30-45 degrees, a tooth width within a range of 0.3-2.0mm, and a side cutting edge angle of 0-2 degree.

36. A machine according to claim 35, wherein said machine comprises a plurality of said milling cutters which are fixedly disposed onto said tool shaft such that said tool shaft extend through center axes of said plurality of said milling cutters and said plurality of milling cutters are spaced apart from each other in an axial direction of said tool shaft at a uniform pitch of 0.1 or more.

37. A machine according to claim 34, wherein said drill unit comprises a single-spindle type or a multiple-spindle type drill unit, said drill unit including a drill having a drill diameter of 0.5-1.5mm, a drill length of 20-30mm two cutting edges of helix angle of 1-10 degrees,

said drill being a straight drill having no back-tapered portion at cutting edges thereof and having a shape edge that has a conical angle with no chisel portion of 55-65 degrees .

38. A machine according to claim 32, further comprises a sequential control device adapted to control operation of said drive motor in place of said numerical control apparatus.

39. A machine according to claim 32, wherein said machine includes two of said saddles, wherein at least one of said tool holders of said two saddles is adapted to detachably support said fixed tool comprising said turning tool comprising a cutting part arranged to have a tooth width within a range of 0.005-1.0mm, a wedge angle within a range of 15-35 degrees, and a front clearance angle within a range of 65-45 degrees, and an other one of said tool holders of said two saddles is adapted to detachably support said rotative tool selected from a group consisting of said milling cutter unit and said drilling unit.

40. A machine according to claim 32, wherein said machine includes only one said saddle, said tool holder being adapted to interchangeably support said fixed tool comprising the turning tool comprising a cutting part arranged to have a tooth width within a range of 0.005-1.0mm, a wedge angle within a range of 15-35 degrees, and a front clearance angle within a range of 65-45 degrees, or said rotative tool selected from a group consisting of said milling cutter unit and said drilling unit.